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ABSTRACT

This paper describes a study which utilized Kitchener and King's (1985) Reflective Judgment model to assess levels of reflectivity in 80 undergraduate students at Southern Illinois University, Carbondale, before and after taking a one-semester general studies course with an environmental focus. A curricular intervention was designed to help students examine their epistemic perspectives. One treatment and two control groups were used. All participants were individually administered Kitchener and King's Reflective Judgment Interview (RJI). For the first time in reflective judgment research, this study demonstrated that a purposefully structured one-semester intervention can result in epistemic development. Those students who were exposed to the one-semester developmental instruction approach had significantly higher reflective judgment change scores in comparison to students who were not exposed to such an approach. This study involved the development and implementation of the Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993), and this pedagogical approach can be credited for the positive gains found. (Contains 5 tables and 32 references.) (Author/SLD)

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The Impact of a Developmental Instruction Approach to
Environmental Education at the Undergraduate Level on
the Development of Reflective Judgment

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This paper describes a study which utilized Kitchener and King's (1985) Reflective Judgment model to assess levels of reflectivity in undergraduate students before and after taking a one semester general studies course with an environmental focus. A curricular intervention was designed to help students examine their epistemic perspectives. The sample in this study consisted of 80 undergraduate students enrolled at Southern Illinois University at Carbondale. One treatment and two control groups were used. All participants were individually administered Kitchener and King's Reflective Judgment Interview (RJI). For the first time in reflective judgment research, this study demonstrated that a purposefully structured one semester intervention can result in epistemic development. Those students who were exposed to the one semester developmental instruction approach had statistically significantly higher reflective judgment change scores in comparison to the students who were not exposed to such an approach. This study involved the development and implementation of the Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993) and this pedagogical approach can be credited for the positive gains found.

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The major purpose of institutions of higher education, as consistently stressed in the mission statements, is the development of individuals who have the capacity to make independent, reasoned judgments about the complex problems of modern society (Welfel & Davison, 1986). Inability to make such independent, reasoned judgments may result in graduates who are incapable of participating as informed and fully functioning citizens in their society and the world. Trow (1989) asserted that one objective of higher education was to give us citizens with "quality of mind" (p. 18). It was his contention that higher education promoted students' intellectual growth by the emphasis placed on learning how to think. Damon (1990) warned that schools cannot treat their students as passive receptacles into which learning can be poured. He emphatically stated: "Whatever else they may try to accomplish, colleges and universities share a central goal: fostering their students' intellectual growth" (p. A48). This intellectual growth, in the form of students' improved capacity as critically thinking persons who are capable of reflective judgment, should be a primary goal for higher education.

With the utilization of Kitchener and King's Reflective Judgment model (1985), levels of reflectivity in undergraduate students were assessed before and after taking a one semester general studies course with an environmental issues focus. The treatment section of the course, Living in the Environment, was designed to help students examine their own epistemic perspectives by challenging them to come to grips with a variety of

controversial issues or ill-structured problems dealing with topics such as pollution, nuclear power, and toxic waste disposal.

The Reflective Judgment model developed by King (1977) and Kitchener (1977) suggests one vision of higher order reasoning, reflective judgment, and how it evolves (see Table 1). Kitchener and King argued that the Reflective Judgment model measures only one aspect of critical thinking, that aspect which involves ill-structured problem solving (Kitchener, King, Wood, & Davison, 1989). According to Kitchener (1992), the process of learning to think and reason more effectively, as described in the Reflective Judgment model developed by King and Kitchener in 1977, is based on four concepts which are assumed to be valid.

1. Individuals actively attempt to interpret and make sense of what they experience. A personal, internal logic exists;
2. Over time, people develop ways of making meaning. New, more mature meanings should replace earlier forms;
3. An individual's development is affected by interaction with the environment, providing that stimulation and support are present; and
4. Individuals do not function "in a stage" (p. 6). Rather, individuals tend to exhibit a range of responses across stages, according to a number of factors, including the "type of feedback and support" provided (p. 7).

Table 1
Reflective Judgment, Development of Epistemic Cognition^a

Stage	How Certain Is Knowledge?	How Is Knowledge Gained?	How Are Beliefs Justified?
1.	Absolutely certain.	By direct observations.	Beliefs are a direct reflection of reality. No need to justify them.
2.	Absolutely certain but not immediately available.	By direct observation and via what authorities say is true.	Direct observation or via authorities.
3.	Absolutely certain about some things; temporarily uncertain about others.	Via authorities in some areas; through our own biases when knowledge is uncertain.	Via authorities in some areas; via what feels good at the moment, where knowledge is uncertain.
4.	No certainty because of situational variables (e.g., data lost over time).	Via our own and others' biases, data, and logic.	Via idiosyncratic evaluations, evaluations of evidence, and unevaluated beliefs.
5.	No certainty except via personal perspectives within a specific context.	Via evidence and rules of inquiry appropriate for the context.	By rules of inquiry for a particular context.
6.	Some personal certainty about knowledge based on evaluations of evidence on different sides of the question.	Via personal assessment of arguments and data, via evaluation opinions of experts.	Via generalized rules of inquiry, personal evaluations that apply across context, evaluated views of experts.
7.	Certainty that some knowledge claims are better or more complete than others, although they are open to re-evaluation.	Via process of critical inquiry inquiry or synthesis.	As more or less reasonable conjectures about the reality of the world, based on an integration and evaluation of data, evidence, and/or opinion.

Note. ^aFrom "The Development of Intellect and Character: A Longitudinal-Sequential Study of Intellectual and Moral Development in Young Adults" by P. M. King, K. S. Kitchener, and P. K. Wood, 1985, *Moral Education Forum*, 10, pp. 1-13.

The Pedagogical Approach

For this study, the researcher developed and implemented a new teaching model, the Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993). The model was created as a result of the synergistic efforts of other researchers interested in cognitive development and developmental instruction. The RJ-DIM is based on the work of Dewey (1933), Perry (1970), Piaget (1970), Kohlberg (1984, 1987), Knefelkamp (1981), and Kitchener and King (1985, 1990a). Aspects of Dewey's and Perry's work on how students think, Piaget's ideas on disequilibrium, Kohlberg's Plus One rule, Knefelkamp's work on developmental instruction, and Kitchener and King's research on reflective judgment were combined to create an innovative pedagogical approach aimed at changing how a student processes information, understands, and subsequently solves problems. Therefore, the power of this paradigm lies in its synthesis and blending of several educational theories and educational models.

Orientation to the Reflective Judgment- Developmental Instruction Model (RJ-DIM)

Syntax of the Model

In terms of a holistic view of the Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993), it can be seen that the concept is grounded in the energy of the group and capitalizes on the potential that comes from differing points of view and perspectives. This is accomplished through carefully sequenced phases (see Table 2).

A Developmental Instruction Approach

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Table 2

Syntax of the Reflective Judgment-Developmental Instruction Model

Phase	Activity
One:	Orientation: Introduction to the issue. Pros and cons of the problem are explored.
Two:	Students take a stand. Focused questions are asked which encourage students to think about their epistemic perspectives.
Three:	Students have the opportunity to articulate their epistemic perspectives in writing.
Four:	Optional Phase: Opportunities where students have a chance to share their epistemic perspectives in pairs or small groups.
Five:	Discussion based on the Plus One rule and disequilibrium.
Six:	Students are left with unanswered epistemological questions involving the ill-structured problem. Some students may want to continue exploring or investigating the issue independently.
Seven:	Retrospective reflection: Topics of discussion are revisited as time allows.

Note. ^aFrom M. M. Kronholm, (1993), The Impact of a Developmental Instruction Approach to Environmental Education at the Undergraduate Level on the Development of Reflective Judgement, p. 57. Ann Arbor, MI: University Microfilms.

In Phase One, the introduction of an ill-structured problem or issue is presented. Students are given ample time to explore and discuss the issue. Resources might include guest speakers who espouse diametrically opposing viewpoints. Supporting materials, such as videos, newspaper and magazine articles, and current books, also help students to analyze, evaluate, and reflect on both sides of the issue.

In Phase Two, the students take a stand on the issue. The instructor asks focused questions which act as a catalyst to encourage students to think about their epistemic perspectives regarding the stance taken. Questions might include: Who do you think is right? How do you decide who is right? Who are the reliable experts in this issue? How do you judge the reliability of an expert? How do you decide who to believe? How do we know? Can we know for sure? With what degree of certainty can we know? What makes one view more compelling than another?

In Phase Three, students are given an opportunity to articulate their epistemic perspectives in writing. In guided practice, the teacher monitors the students as they work, provides additional information as needed, clarifies questions, and gives positive feedback. In independent practice, the students work individually to formulate and organize their thoughts and ideas. In both instances, the students' written responses are collected after the discussion, in order to:

1. give the instructor a chance to target interventions on a one-to-one level, via written feedback.
2. allow xeroxed copies of the answers to be made and placed in each student's class folder. Hence, over time, the instructor will accumulate portfolios which map out each individual's cognitive development.

According to Thompson (1990):

Portfolio materials represent performance in actual learning processes and show how students work on substantive academic problems, rather than in artificial testing situations. Portfolio evaluation can be developmental rather than distracting or intrusive, because preparing portfolio documents can be an important learning experience in itself. (p. 6)

3. give the instructor an opportunity to compile a set of student excerpts, which represent a variety of reflective judgment levels and can be used later as a focused discussion tool. Anonymity is honored so that students will not feel inhibited in the completion and submission of their written responses.

Phase Four of the model is an optional step. In this phase, students are given the chance to share their epistemic perspectives, in pairs or in small groups, prior to the large group class discussion. Students, who are sometimes hesitant to share their thoughts and perspectives in large group settings, may feel less inhibited if placed in small groups. Ideally, these groups should be carefully planned in terms of participants. For optimal results, students should be at dissimilar levels of reflective judgment. It is important to note that the instructor loses some control in Phase Four. Students in the small groups

may lose their epistemological focus and, instead, broaden the focus to a more general discussion of the issue. This loss of focus is to be expected and the teacher should be prepared to refocus groups as needed. If the class size is too small, if time considerations make this phase prohibitive, or if the control issue is a concern, the instructor may elect to move directly to Phase Five.

In Phase Five, the class discusses the focused questions. The answers and comments disclosed earlier provide the teacher with clues about the students' epistemological perspectives. Once an individual student's typical reasoning style is identified, the educator can then target his or her interventions one stage higher, using the Plus One rule (Arbuthnot & Faust, 1981). The Plus One rule holds that a student can understand and appreciate a position which is no more than one stage above his/her current level. However, discourse from more than one stage above current reasoning cannot be assimilated or accommodated by the student. It is important to note that the Plus One rule promotes disequilibrium, an important aspect in this fifth phase of the model. According to Joyce and Weil (1986), disequilibrium is a precursor to developmental change:

Our nature as learners contains an interesting contradiction: Important growth requires change. We have to give up our comfortable ways of thinking and survive the buffets of taking on unfamiliar ideas, skills, and values. The need to grow is built into the fiber of our being. We are impelled upward in a developmental sense. Paradoxically, however, we have an ingrained tendency to conserve our beings as they are or were. Nostalgia is, in fact, a yearning not to have grown or changed. We would

like to go on and see things the way we were when we were young and untutored. Curiously, the answer is to produce disequilibrium--to create environments that impel us to change, not discarding what we were at any given stage, but learning to build on it productively. . . The learner needs to confront problems and diverse opinions in order to reach beyond the present stage and develop the constructs that will sustain growth at another level. (p. 447)

In Phase Six of the model, students are left with unanswered, epistemological questions. The typical closure to a discussion is purposefully lacking in this model, in order to stimulate cognitive conflict and encourage reflection. Right answers are not and cannot be given. This ambiguity reinforces the idea that significant learning is frequently accompanied by discomfort. As Joyce and Weil (1986) emphasized:

If the environment is too comfortable or 'reliable' the learners may be satisfied at the stage of concrete thinking, where the ability to integrate new information and form new conceptual systems is limited indeed. To impel learners to diverge from the familiar sets of concepts that enable them to view the world in 'blacks and whites,' the environment must be dissatisfying in some ways. (p. 438)

This dissatisfaction, however, must be offset with support. It is imperative that the instructor be nurturing and caring if students are to successfully cope with both the cognitive and affective dissonance which may ensue. In addition, it is desirable that the instructor be one who can support and encourage learner autonomy. Some students may want to continue an exploration of the ill-structured problem independently, because knowledge-seeking behavior is easily aroused and strongly reinforced by the RJ-DIM (Kronholm, 1993).

In Phase Seven of the model, topics of discussion are revisited. If cognitive development has occurred, retrospective

reflection gives students an opportunity to use new epistemic filters to view the ill-structured problems which were explored earlier in the course.

Social system. The RJ-DIM (Kronholm, 1993) is highly structured. The model begins with the introduction of an ill-structured problem or issue and leads to an exploration of the problem or issue, followed by very specific and focused questions, aimed at encouraging students to think about their epistemic assumptions. Therefore, in contrast to other pedagogical approaches such as the Jurisprudential Inquiry Model (Joyce & Weil, 1986) and moral education simulations or discussions (Arbutnot & Faust, 1981; Hersh, Paolitto, & Reimer, 1979), the RJ-DIM is not solely focused on issues in relation to public policy nor a redefinition of social values, per se. Similar to the Socratic dialogue (Joyce & Weil, 1986), the scope of the RJ-DIM is broader and, in particular, the goal is to encourage further cognitive development. The model concludes with a discussion that helps students explore their own and others' epistemic perspectives. An important caveat regarding the RJ-DIM: The teacher should be careful that a generic discussion of the issue does not become the focus of the activity. Instead, he or she should aim to turn the students toward an examination and reflection on their epistemic viewpoints as they relate to the issue.

The following social system variables are needed if the RJ-DIM (Kronholm, 1993) is to be successful.

1. A teacher who has a thorough understanding of developmental theory.
2. A teacher who is competent in the facilitation of an open, supportive, and accepting social climate.
3. A teacher who is willing to give up the role of an all-knowing authority.

In order to assess the higher order thinking that the model purports to cultivate, the teacher may want to have an outside observer use an on-site evaluation tool to provide information on the extent to which the RJ-DIM (Kronholm, 1993), and the instructor implementing it, promote classroom thoughtfulness. Structured observations can give the teacher the support and challenges required for the development and refinement of his or her instructional skills. Encouragement and feedback are important because, "the instructional skills necessary to lead open and productive discussions are among the most difficult to learn and complex to implement in any teacher's repertoire" (Leming, 1992, p. 149).

The support system. Support materials for the RJ-DIM (Kronholm, 1993) include up-to-date books, newspaper articles, magazine stories, and audio-visual materials which present both the pros and cons of ill-structured problems or issues. Examples of books that were used in this research included: T. D. Goldfarb's (1991), Taking Sides: Clashing Views on Controversial Environment Issues; J. Allen's (1991), Annual Editions: Environmental Yearbook 91/92; and G. T. Miller Jr.'s (1990),

Living in the Environment: An Introduction to Environmental Science. Guest speakers, who represent opposing viewpoints, may also be invited to the classroom.

Support materials, in the form of video programs, are available from a wide variety of sources. For example, the Agency for Instructional Technology, Bloomington, Indiana has created a series of programs, classified as Interactions in Science and Society. Two of these 20 minute videos, Acid Rain and Genetic Engineering, were used in this current research.

When current books, newspapers articles, magazine stories, and video programs are not readily available, the instructor may want to construct briefing sheets which outline the conflicting viewpoints for a given issue. Although this current research was focused on environmental issues, ill-structured problems can be found in a wide array of disciplines, including the social sciences, business, and humanities.

The optimal support system for the RJ-DIM (Kronholm, 1993) is premised upon a teacher who is well-grounded in developmental theory, especially as it relates to reflective judgment. In order to develop stage-appropriate tasks, the teacher should have a thorough understanding of the Reflective Judgment Model (Kitchener & King, 1985). This model is discussed later under the section, Instrumentation.

Finally, a classroom that is physically conducive to large and small group discussions is necessary. This means a classroom where the chairs or desks can be easily moved into one large circle or groupings of several small circles.

Principles of reaction. In the RJ-DIM (Kronholm, 1993), the teacher must create a supportive environment so that students feel free to respond. The teacher must be careful that discussion of the issue does not become the focal point of the activity. The issue is merely a vehicle to encourage students to examine and reflect on their epistemic perspectives.

To utilize the RJ-DIM (Kronholm, 1993), the instructor selects the ill-structured problem to be explored and then carefully formulates the focal questions which relate to that problem. It is important that the instructor recognizes the need to respond to students in a carefully thought-out manner. For this model to work effectively, several requirements are necessary.

1. The teacher must be able to help the students recognize and contrast alternative points of view. Through reflection, paraphrasing, or summarization of student responses, the teacher increases students' awareness of their own views and feelings.
2. The teacher must be able to anticipate students' answers and must be prepared to challenge and probe.
3. The questioning of assumptions must be tempered with supportiveness. Also, the teacher's comments should encourage free and honest expression of ideas, feelings, and opinions.
4. Teachers should be able to help the students clarify their positions, understand their assumptions, and communicate more effectively with one another.

5. Teachers should be willing to model how they think.
6. The reactions of the teacher are primarily those of a facilitator. He or she must maintain a nonevaluative but supportive attitude and offer appropriate stimulating comments at the right moment.

The following summary chart serves to briefly describe and summarize the operational heart of the RJ-DIM (Kronholm, 1993) (see Table 3). The seven phases are reviewed as well as the requisite factors of social system, principles of reaction, and support system. Additional aspects of the model are modes of application and instructional and nurturant effects.

Application. The RJ-DIM (Kronholm, 1993) is based on the work of Kitchener and King (see Table 1). A more detailed explication of the developmental sequence for Reflective Judgment was developed by Kitchener and King (1990b) and is presented in Table 4.

Kitchener and King (1990b) believe that, not only is it possible to influence a student's level of reflective judgment, but that it is important to organize instruction with development as a guiding principle. The important conditions seem to be:

1. interventions targeted no more than one or two stages higher than where the student typically responds;
2. disequilibrium or exposure to contradictions in the student's current perspectives;
3. use of a teaching style and textbooks that do not promote the facade of touting absolute truth; and

Table 3

Summary Chart: Reflective Judgment Developmental Model (RJ-DIM)^a

Phase One, Orientation: 1. Introduction of the issue. 2. Pros and cons of the issue are explored and discussed. 3. Students are given time to analyze, evaluate, and reflect on both sides of the issue.	Social System: The model is highly structured. The teacher's role is to select the ill-structured problem or issue and correlate stage-appropriate tasks to pose the focal questions that relate to the ill-structured problem and to facilitate discussions so that it will challenge students' epistemic meaning perspectives. It is important to note that student interest and input are necessary in order to choose ill-structured problems which are relevant and meaningful.
Phase Two: Students take a stand and, at times, may be involved in synthesizing or evaluating possible solutions. Focused questions, which act as a catalyst in getting students to think about their epistemic perspectives, are asked.	Principles of Reaction First and foremost, the teacher needs competence in facilitating an open, accepting social climate. The teacher's job is to initiate the sequence and help students develop and refine their epistemic perspectives. The teacher needs to react in such a way as to help students define their beliefs and opinions. In essence, the teacher shapes the class session by the type of questions s/he asks and, through questioning, establish the focus. Support System Stage-appropriate tasks and activities. Diversity of experiences is encouraged (debates, simulations, Socratic dialogues, etc.). Flexibility in arranging the classroom for both small and large group discussions. The students need to be able to see and converse with each other without raising their voices and exchange ideas and opinions in a comfortable atmosphere. This is probably best achieved by arranging the chairs in a circle. In addition, for small group discussions, the groups need to be far enough apart so that they do not interfere with each other's learning. Up-to-date books, magazines, newspapers and videos which present conflicting viewpoints about ill-structured issues should be provided.
Phase Three: Students have a chance to articulate their epistemic perspectives in writing. The written work can be handed in: (a) so that one-to-one feedback can be given, (b) to be used as portfolio material, and (c) to be used in subsequent discussions.	
Phase Four (Optional): Opportunities are provided where students have a chance to share their epistemic perspectives in pairs or in small groups prior to the large group class discussion.	
Phase Five: Discussion based on the Plus One rule and disequilibrium.	
Phase Six: Students are left with unanswered epistemological questions involving the ill-structured problem. Cognitive conflict and support are necessary if developmental growth is to occur. Student autonomy regarding additional exploration of the ill-structured problem is encouraged, though not required.	
Phase Seven: Topics of discussion are revisited as time allows. This gives the students a chance for retrospective reflection. What are their positions now? Have their epistemic filters changed?	

Note: ^aFrom M. M. Kronholm, (1993), The Impact of a Developmental Instruction Approach to Environmental Education at the Undergraduate Level on the Development of Reflective Judgement, p. 75. Ann Arbor, MI: University Microfilms.

Table 4
Description of Stages in the Reflective Judgment Developmental Sequence^a

Stage One	At this stage, knowing is characterized by a concrete, single-category belief system: what the person observes to be true is true. Individuals assume that knowledge is both absolute and concrete. Since they need only to observe to know what exists, individuals do not acknowledge that problems exist for which there are not absolutely true answers. This stage in its purest form is probably only found in young children.
Stage Two	Knowing takes on more complexity at this stage since individuals assume that while truth is ultimately accessible, it may not be directly and immediately known to everyone. Since truth is not available to everyone, some people hold "right" beliefs while others hold "wrong" ones. Perry (1970) called this belief system dualism. However, since the truth may ultimately be known, individuals continue to assume that all problems are solvable. As a consequence, they assume that the knower's role is to find the right answer and that the source of this answer will be an authority, for example, a teacher, priest, or doctor. This frame of reference is most typical of young adolescents, although some college students continue to hold these assumptions.
Stage Three	At this stage, individuals acknowledge that in some areas truth is temporarily inaccessible, even for those in authority. In other areas, they maintain the belief that authorities know the truth. In areas of uncertainty, they maintain the belief that absolute truth will be manifest in concrete data sometime in the future and argue that, since evidence is currently incomplete, no one can claim any authority over his or her own personal impressions or feelings. Beliefs can only be justified on the basis of problems right at the moment. Implicitly, however, they maintain the assumption that ultimately all problems have solutions and that certainty will, in the long run, be attained. Students in their last two years of high school or first year college typically score at about Stage Three.
Stage Four	The uncertainty of knowing is initially acknowledged in this stage and is usually attributed to limitations of the knower. Without uncertainty, individuals argue that knowledge cannot be validated externally, thus they argue that it is idiosyncratic. They often appear confused about how to make claims to knowledge, in light of uncertainty and without authorities to provide them with answers. In fact, individuals at this stage frequently express skepticism about the role of authorities. Stage Four, ill-structured problems are offered (legitimacy). Such reasoning is most typical of college seniors.
Stage Five	At this stage, individuals believe that knowledge must be placed within a context. This assumption derives from the understanding that interpretation plays a role in what a person perceives. Although these individuals move beyond the idiosyncratic justifications of Stage Four to argue that justification must be understood as involving interpretation of evidence within a particular perspective, they cannot compare and evaluate the relative merits of two alternative interpretations of the same issue . . . this type of reasoning is most typical of graduate students.
Stage Six	Individuals at this stage believe that knowing is uncertain and that knowledge must be understood in relationship to the context from which it was derived. In addition, they argue that knowing involves evaluation and that some perspectives, arguments or points of view may be evaluated as better than others. These evaluations involve comparing evidence and opinions across contexts which allows an initial basis for forming judgments about ill-structured problems. Such solutions are typically found among advanced graduate students.
Stage Seven	Although individuals at this stage believe that knowing is uncertain and subject to interpretation, they also argue that epistemically justified claims can be made about the better or best solution to the problem under consideration. As with Dewey's (1933) description of reflective thinking, individuals claim that knowledge can be constructed via critical inquiry and through the synthesis of existing evidence and opinion into claims that can be evaluated as having greater truth value or being more warranted than others. Individuals argue that such views can be offered as reasonable current solutions to the problem. . . such reasoning is a rarity even in graduate students, although it is found in some educated adults as they mature into their thirties and beyond.

^aFrom K. S. Kitchener & P. M. King, (1990b), "The Reflective Judgment Model: Transforming Assumptions About Knowing." In J. Mezirow (Ed.), *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning* (pp. 162-166). San Francisco: Jossey-Bass.

4. an open and supportive social climate in which students can articulate and share their epistemic perspectives.

In terms of specific educational practice, the first task is to learn about the students' current level of reflective judgment. This can be attempted through the use of carefully focused discussions and tasks focused on appropriate stage levels.

According to Kitchener and King (1990b), they have not yet developed or tested a program designed to help students examine their own epistemic perspectives. The RJ-DIM (Kronholm, 1993), therefore, may be one of the most important outcomes of this current research. This model offers an approach that can systematically and purposefully challenge and support a student's current level of reasoning.

Instructional and nurturant effects. Five instructional effects of the RJ-DIM (Kronholm, 1993) have been identified. The RJ-DIM:

1. gives students a framework for the analysis of ill-structured problems or issues;
2. permits students to make reflective judgments;
3. challenges epistemic assumptions, explores one's view of knowledge, and helps to develop epistemic meaning perspectives;
4. increases an awareness and an understanding of alternative perspectives, promotes accurate perspective-taking; and

5. gives students facts about ill-structured problems or issues.

Four nurturant effects of the RJ-DIM have been identified, also. The RJ-DIM:

1. promotes open-mindedness, tolerance, and self-esteem;
2. helps students realize the tentative nature of knowledge;
3. helps students to be comfortable in expressing their opinions; and
4. reinforces critical thinking skills used in the analysis of well-structured problems.

Methodology

The sample in this study consisted of 80 undergraduate students from Southern Illinois University at Carbondale. A total of 80 students participated in one of three groups; 28 students were assigned to the treatment group and each of the two control groups were comprised of 26 students. All participants were individually administered Kitchener and King's (1985) Reflective Judgment Interview (RJI) as pretest and posttest.

Instrumentation

Reflective Judgment Interview: An Overview

The Reflective Judgment Interview (RJI) is a copyrighted instrument that includes four ill-structured problems and a set of standardized probe questions. Copyrighted scoring rules are used to score each individual's response to the interview and, in

general, inter-rater reliability has been moderate to high, ranging from 70% to 80% in most samples (Mines, 1982). Interviewer certification and rater procedures have been established and can be obtained by contacting Kitchener or King; mailing addresses are provided in the Kitchener and King 1985 citation.

The Reflective Judgment Model is based on the work of Perry (1970). The model describes the shifts that occur in assumptions about knowledge and in the way a person justifies his or her beliefs and decisions. Perry's original model consisted of nine positions, which ranged from basic dualism in position one, to committed relativism in position nine. Kitchener (1977) and King (1977) collapsed the nine positions into seven stages, which describe a series of changes that occur in the ways adolescents and adults understand the process of knowing. These seven stages range from dualism in stage one, to multiplicity in stage four, to relativism in stage seven (see Table 4).

The Reflective Judgment Interview format is a straightforward technique which can be used to assess a person's level of reflectivity. First, an ill-structured problem, called a dilemma, is presented to the interviewee. There are four dilemmas, which are drawn from the domains of physical science, social science, biology, and history. Examples of the standard RJI dilemmas follow.

Some people believe that news stories represent unbiased, objective reporting of news events. Others say that there is no such thing as unbiased, objective reporting, and that even in reporting the facts, the news reporters project their own interpretations into what they write.

There have been frequent reports about the relationship between chemicals that are added to food and the safety of those foods. Some studies indicate that such chemicals can cause cancer, making these foods unsafe to eat. Other studies, however, show that chemical additives are not harmful and actually make the foods containing them more safe to eat.

Many religions of the world have creation stories. These stories suggest that a divine being created the earth and its people. Scientists claim, however, that people evolved from lower animal forms (some of which were similar to apes) into the human forms known today.

Most historians claim that the pyramids were built as tombs for kings by the ancient Egyptians, using human labor, and aided by ropes, pulleys and rollers. Others have suggested that the Egyptians could not by themselves have built such huge structures, for they had neither the mathematical knowledge, the necessary tools, nor an adequate source of power. They claim that the Egyptians were aided by visitors from other worlds. (C. Lynch, personal communication, Sept. 20, 1991)

The task for the respondents is to explain and defend their judgment about the issue and, in addition, explain in what way they know their belief to be true. Responses to these issues are elicited through semi-structured probe questions. The probe questions are designed to help the respondents elaborate on their ideas and clarify their answers. The following probe questions are asked:

1. What do you think about these statements?
2. On what do you base that point of view?
3. How did you come to hold that point of view?
4. Can you ever know for sure that your position about this issue is correct? How?/Why not?

5. When people differ about matters such as this, is it the case that one opinion is right and one is wrong? Why?/Why not?
6. Could you say that one opinion about this issue is in some way better than the other? How?/Why not?
7. How is it possible that people can have such different points of view about this topic?
8. What does it mean when experts in the field disagree about this issue? (How do you explain or understand such disagreements?) (C. Lynch, personal communication, September 20, 1991)

The responses to the probe questions are scored through the use of the Reflective Judgment scoring rules (Kitchener & King, 1985). Scoring is usually conducted by two certified RJT raters who evaluate the respondent's assumptions about knowledge, certainty of knowledge, use of evidence, and nature of justification. Responses to each of the questions are scored, using a three digit code. The first two digits represent the dominant and subdominant stages used in the response. The third digit is used to weight the dominant stage. In order to make group comparisons, a mean score for each respondent is derived by averaging scores across all dilemmas and both raters. According to Kitchener, King, Wood, and Davison (1989):

using the three-digit summary code for each problem assures that raters are assigning an equal number of scores to each problem and that the frequency distributions of subjects' scores at each testing have equal n's; this facilitates comparisons of individual change over time. Some stage

models, for example, Colby et al. (1983), have used a two-digit code to summarize responses to a problem. With such codes, if more than two stages are used in scoring a single problem, they cannot be represented in the final score. The three-digit code more accurately allows subject variability to be represented. (p. 79)

For this study, 474 student interviews were conducted; each interview was audiotaped, transcribed, and submitted to the two RJI certified raters for rating. This researcher was trained and certified by Dr. King (i.e., one of the original RJI model developers) and conducted all student interviews. Through this process, pretest and posttest ratings were established and comparison scores were made between the three groups.

Data Source

Statistical analyses were performed using multiple regression and analysis of covariance (ANCOVA) which produced F ratio statistics, associated probability levels, and the grand means of control and treatment groups. All means and standards deviations were rounded to the nearest thousandth. Computations for data analyses were conducted on an Apple Macintosh SE computer using the FASTAT Program (Systat, 1989).

Results and Educational Importance of the Study

The most significant finding in this research was that, for the first time in reflective judgment research, a purposefully structured one semester intervention resulted in epistemic development. Students exposed to the one semester developmental instruction approach had statistically significant higher Reflective Judgment change scores in comparison to students who

were not exposed to such an approach. An analysis of covariance, controlling for the pretest scores, on gain scores for Treatment Group 3 versus Control Groups 1 and 2 was conducted. A statistically significant difference between groups was detected ($F = 14.594$, $df = 1$, $p < 0.000$). The gain for Treatment Group 3 was from 3.234 on the pretest to 3.530 on the posttest, a gain of .296 of a stage (see Table 5).

Table 5

Group Means and Standard Deviations for Reflective Judgment Pre- and Post-Interviews and Gain Scores

	Group					
	Control 1 ^a		Control 2 ^b		Treatment 3 ^c	
	(n = 26)		(n = 26)		(n = 28) ^d	
	Mean	SD	Mean	SD	Mean	SD
Pretest	3.585	0.301	3.587	0.340	3.234	0.301
Posttest	3.442	0.282	3.471	0.300	3.530	0.264
Gain	-0.158	0.233	-0.116	0.308	0.296	0.308

NC. 9. ^aControl Group 1, students not exposed to RJ-DIM. ^bControl Group 2, students not exposed to the RJ-DIM. ^cTreatment Group 3, students exposed to the RJ-DIM. ^dTotal n = 80 students.

The second significant aspect of this research was the development and implementation of the Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993), which can be credited for the positive gains found in this study. The creation of this model was an attempt to do what Kitchener and King have not yet done. According to Kitchener and King (1990b), "Our work has been primarily on developing and empirically testing the reflective judgment model. . . We have not developed or tested a program designed to help students examine their own epistemic perspectives" (pp. 171-172).

Recommendations

Research Recommendations

1. Contrary to prior Reflective Judgment research, it was found that carefully structured, one semester interventions were effective in this study. However, the research sample in this study was comprised of only 80 undergraduate students. While these numbers are comparatively large for a developmental study using an interview format, the sample is still a small one from which to generalize results. Gathering additional data with other populations should receive a high priority. This study should be replicated: (a) in other courses, (b) at the graduate level instead of the undergraduate level, (c) at other universities, and (d) in other demographic areas.

2. A longitudinal study should be conducted to examine the effects of a developmental instruction approach over time. The findings of this study indicate that reflective judgment

levels can be enhanced by purposefully planned curricular interventions. Development of articulated undergraduate programs which would allow for research to compare the longitudinal effects of repeated exposure to specific models, such as the RJ-DIM, are highly recommended.

3. A qualitative research study should be conducted with particular attention directed to students' progress which is not necessarily reflected in the Reflective Judgment Interview ratings. As Kitchener (1992) pointed out, while the numerical differences may be small, the qualitative differences are important ones. Closer analysis of such qualitative differences is highly encouraged.

4. Use of the Reflective Judgment Interview approach for student assessment is both expensive and time consuming. Interviews must be scored by trained raters and the current cost of such ratings is approximately \$18 per subject for the pre- and posttests. With two raters, this cost is doubled. Ratings are carried out through use of the transcribed interviews and represent another major cost issue with such a project.

Although some educators view an objective measure of the Perry scheme as an oxymoron (Moore, 1991), perhaps an objective measure for the Reflective Judgment Interview should be attempted. Two major advantages of utilizing an objective measure are: (a) the ease with which such instruments can be administered and scored, since trained raters are not required to score the instrument, nor is it necessary to work from elaborate rating manuals; and (b) the cost factor. Because objective measures are

much less expensive than interview formats, these instruments can be used to gather more extensive data in large-scale studies, such as an assessment of college outcomes.

Educational Recommendations

1. The Reflective Judgment-Developmental Instruction Model (RJ-DIM) (Kronholm, 1993) represents one effective method that facilitates cognitive development. The inclusion of this methodology in other undergraduate courses is highly recommended. Although the lesson ideas included in this model are based on environmental issues, the RJ-DIM approach could be applied easily to issues for use in courses such as health, social studies, agriculture, business, law, and home economics. The use of this strategy in other areas would not only promote reflective thinking but could perhaps have a multiplier effect if a student was exposed to the approach in more than just one course.

2. Knowledge of the levels and sequence of reflective judgment can help provide teachers with some of the tools necessary to understand students' cognitive orientations and promote their intellectual development. However, knowledge is only one of the first steps. Application of this information in the classroom setting is crucial if any real change is to be realized. Preservice teacher training programs should link developmental theory to developmental instruction models. Training programs should include the development of instructional approaches which would equip future teachers with the requisite

knowledge and skills to adopt and incorporate such pedagogical techniques in the classroom.

3. The results of this study, along with the previous research cited earlier, have produced a solid research base which indicates how one aspect of higher order reasoning, reflective judgment, develops. Using this research base, specific pedagogical approaches (e.g., the RJ-DIM) need to be developed, refined, implemented, and examined. Finally, in order to evaluate the extent to which such approaches are successful, the Reflective Judgment Interview can be employed as an assessment tool.

4. A Reflective Judgment Network should be established. Such a network could serve as a support group for people interested in research, pedagogical approaches, and curricular interventions related to reflective judgment. Acknowledging that teaching and educational practice is problematic, complex, and uncertain encourages critical analysis. Such an analysis is needed if the gap between what practitioners think they are doing and what they are actually doing is to be reduced. Collaborative work in the field of reflective judgment could help change a school culture that promotes the following hidden curriculum objectives.

The teacher 'teaches' and the students 'sit and listen' or 'learn' passively.

There is one 'right answer' to any question, and it is in the book to be read.

The answer to most questions can be given in one or two words, and no one will challenge you to go much deeper.

Books and teachers are always 'right,' and we learn only from them, not any other resource in the room, such as our friends. (Barell, 1991, p. 237)

Conclusions

In contrast to the findings from previous research conducted in Reflective Judgment, the data analyses from this study provided evidence that the treatment group (i.e., Group 3), which was exposed to the one semester developmental instruction approach, had significantly higher reflective change scores when compared to the two control groups (i.e., Groups 1 and 2). The Reflective Judgment pretest mean score for Group 3 was 3.234 and posttest mean score was 3.530, a gain of .296. While the numerical difference may not seem dramatic, the qualitative difference is an important one. This gain score reflects a shift to a style of reasoning whereby the individual begins to use evidence to make judgments (i.e., Stage 4), as opposed to a reasoning style that is based solely on personal beliefs (i.e., Stages 2-3).

Research findings in the area of cognitive development have demonstrated that one semester interventions can be effective. As an example, Enright, Lapsley, and Levy, Jr. (1983) found that subjects who were exposed to a one semester, Plus-One discussion strategy gained approximately one-quarter to one-half of a Moral Judgment Interview (MJII) stage. They stated that:

the first strategy to emerge and the least complex, although possibly the most difficult to implement, is the plus-one exchange. Here, the educator, through modeling of ideas one

level above the student's current level, attempts to induce cognitive disequilibrium and eventually to stimulate growth to the next higher moral level. (p. 44)

Similarly, the pedagogical strategy of Plus One discussion and cognitive disequilibrium was utilized in this study and is an integral part of the RJ-DIM (Kronholm, 1993).

The necessary effort to encourage students to think at higher levels of the Reflective Judgment model (King, 1977; Kitchener, 1977) requires an effective balancing act between the provision of appropriate challenges and support to students who are at dissimilar stages of cognitive development. The RJ-DIM (Kronholm, 1993), which is based on support and challenge, provides an instructional approach that educators can utilize to create more meaningful and intellectually stimulating classrooms. Because this model depicts the learning environment and outlines the strategies which instructors can use to promote higher levels of reflective judgment, educators may be persuaded to think about their interactions with students and develop strategies that more effectively teach students to think at the higher levels.

The factors of support and challenge are integral to the development of reflective judgment. A major purpose of this presentation was to provide the requisite support (i.e., explication and operational heart of the RJ-DIM) in order that faculty can consider an integration of the RJ-DIM in their pedagogical approaches. The challenge hereby presented is that faculty reflect on this new model and consider how the RJ-DIM can realistically be incorporated into their present approach to

instruction and facilitate the process of student learning. As the ongoing research in Reflective Judgment continues, the use of the RJ-DIM by individual faculty can facilitate the acquisition of new knowledge.

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